Project Based Learning-II

(Guidelines and Work Book)

Course Code: 210258

(2019 Course)

Second Year Engineering

Year 2022 - 2023

Group ID:

–	–	C	9

Team Members: 1. Ayush Jain

2. Dhruv Yaranalkar

3. Nikhil Ingale

4. Atharva Pimple

Project Title : Fire Extinguisher Robot

Name of Mentor: Prof : Vaibhav Suryavanshi

Prof : Disha Sengupta

DEPARTMENT OF AI&DS ENGINEERING

DR. D. Y. PATIL INSTITUTE OF TECHNOLOGY, PIMPRI, PUNE

SAVITRIBAI PHULE PUNE UNIVERSITY

2019 - 2020

Preamble

For better learning experience, along with traditional classroom teaching and laboratory learning; project based learning has been introduced with an objective to motivate students to learn by working in group cooperatively to solve a problem, Project-based Learning (PBL) is a student centric pedagogy that involves a dynamic classroom approach in which it is believed that students acquire a deeper knowledge through active exploration of real world challenges and problems. Students learn about a subject by working for an extended period of time to investigate and respond to a complex question, challenge or a problem. It is a style of active learning and inquiry-based learning.(Reference: Wikipedia). Problem based learning will also redefine the role of teacher as mentor in learning process. Along with communicating knowledge to students, often in a lecture setting, the teacher will also to act as an initiator and facilitator in the collaborative process of knowledge transfer and development.

This is a recommended workbook for PBL that will serve the purpose and facilitate the job of students, mentor and coordinator. This workbook will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken.

CERTIFICATE

This is to certify that Mr./ Ms. Ayush Jain , Dhruv Yaranalkar , Nikhil Ingale , Atharva Pimple Group No:C9 ; Division : C ; Branch : Artificial Intelligence & Data Science ; has successfully completed the work associated with **Project Based Learning II** titled as **FIRE EXTINGUISHER ROBOT** and has submitted the work book associated under my supervision, in the partial fulfillment of Second Year Bachelor of Engineering(Choice Based Credit System) (2019 course) of Savitribai Phule Pune University.

Date: 22/05/2023

Place: Pimpri

Guide	Head Of Department	Principal
Prof : Vaibhav Suryavanshi	Dr. Vinod V. Kimbahune	Dr .Lalit. Wadhwa
Prof : Disha Sengupta		

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1. Project Based Learning Syllabus:

Course Objectives:

- To develop critical thinking and problem solving ability by exploring and proposing solutions to realistic/social problem.
- To Evaluate alternative approaches, and justify the use of selected tools and methods.
- To emphasizes learning activities that are long-term, inter-disciplinary and student-centric.
- To engages students in rich and authentic learning experiences.
- To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.
- To develop an ecosystem that promotes entrepreneurship and research culture among the students.

Course Outcomes:

CO1: Identify the real life problem from societal need point of view
CO2: Choose and compare alternative approaches to select most feasible one
CO3: Analyze and synthesize the identified problem from technological perspective
CO4: Design the reliable and scalable solution to meet challenges
CO5: Evaluate the solution based on the criteria specified
CO6: Inculcate long life learning attitude towards the societal problems

Group Structure:

Working in supervisor/mentor – monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

- There should be team/group of 5 -6students
- A supervisor/mentor teacher assigned to individual groups
-

Selection of Project/Problem:

The problem-based project oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. Students design and analyze the problem within an articulated interdisciplinary or subject frame. A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students' wondering within different disciplines and professional environments. A chosen problem has to be exemplary. The problem may involve an interdisciplinary approach in both the analysis and solving phases .By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry. There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content and structure of the activity.

- A few hands-on activities that may or may not be multidisciplinary
- Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize and present their learning.
- Activities may include-Solving real life problem, investigation /study and Writing reports of in depth study, field work**.**

Assessment:

The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness. Progress of PBL is monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment AND evaluation the individual and team performance is to be measured. PBL is monitored and continuous assessment is done by supervisor/mentor and authorities. Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes.

Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

- Individual assessment for each student (Understanding individual capacity, role and involvement in the project)
- Group assessment (roles defined, distribution of work, intra-team communication and togetherness)
- Documentation and presentation

Evaluation and Continuous Assessment:

It is recommended that the all activities are to be record and regularly, regular assessment of work to be done and proper documents are to be maintained at college end by both students as well as mentor (you may call it PBL work book).

Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department and institutes. Recommended parameters for assessment, evaluation and weightage:

- Idea Inception (5%)
- Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product (50%)(Individual assessment and team assessment)
- Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) (25%)
- Demonstration (Presentation, User Interface, Usability etc) (10%)
- Contest Participation/ publication (5%)
- Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects (5%)

PBL workbook will serve the purpose and facilitate the job of students, mentor and project coordinator. This workbook will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken.

References:

- Project-Based Learning, Edutopia, March 14, 2016.
- What is PBL? Buck Institutes for Education
- www.schoology.com
- www.wikipedia.org
- www.howstuffworks.com

2. Recommended Guidelines and Phases:

PBL is learning through activity. One of the teachers can be appointed as coordinator for PBL. Following are the recommended guidelines that will work as an initiator and facilitator in process of completion of PBL.

1. In first week of commencement of 2nd semester or preferably at the end of first semester let the coordinator create awareness about PBL(what, why, and how) among the students. Convey students expected outcomes, assessment process and evaluation criteria.
2. Get groups of students registered preferably 4-6 students per group.
3. Assign mentor to each group.
4. Provide guidelines for title identification (Problem can be some real-life situation that needs technology solutions. This situation can be identified by meeting people around, visiting various industries, society, and institutes. The solution can be prototype, model, convertible solutions, survey and analysis, simulation, and similar).
5. Let students submit the problem identified in prescribed format (Title, Problem statement, details of a problem undertaken, and what is need of solution to the problem)
6. Coordinator and mentor can approve the problem statements based on feasibility and learning outcomes expected for first year engineering students
7. Mentor is to monitor progress of the task during phases of project work. Broadly phases may include- requirements gathering, preparing a solution, technology design for the solution (optional phases- implementation and testing)
8. Weekly monitoring and continuous assessment record is to be maintained by mentor.
9. Get the report submitted at the end of semester.

3. Evaluation and Assessment Sheet (To be filled in my mentor)

Sr. No.	Details	Maximum Marks	Marks Obtained
1.	Problem Identification (Idea Inception)	**10**	
2.	Problem Analysis (Requirement Gathering)	**15**	
3.	Proposed Solution Model/Design/ Process / prototype	**20**	
4.	Technology Solution Model	**15**	
5.	Expected Outcomes	**05**	
6.	Implementation and Testing	**10**	
7.	Regularity (Attendance + Weekly Progress Reporting)	**10**	
8.	Awareness /Consideration of - Environment/ Social /Ethics/ Safety measures/Legal aspects	**05**	
9.	Contest Participation/ publication	**05**	
10.	Report	**05**	
Total Marks		**100**	

Date: 22/05/2023

Name & Sign of Mentor: Prof : Vaibhav Suryavanshi Prof : Disha Sengupta

4. Project Information Sheet

Project ID	C9				
Title	Fire Extinguisher Robot				
Problem Statement	As its very difficult sometimes for fire-fighting personels to go & extuinguish fire so we”re building a robot which can extinguish fire with its own specifications.				
Name of Mentor	Prof : Vaibhav Suryavanshi Prof : Disha Sengupta				
Group Members	Division	Roll No.	Name	Mobile Number	Email ID
4	C	17	Ayush Jain	8390145957	ayushpoonmia2003@gmail.com
	C	22	Dhruv Yaranalkar	7760141640	djyaranalkar@gmail.com
	C	23	Nikhil Ingale	9075367086	nikhiledu123@gmail.com
	C	63	Atharva Pimple	8237931543	atharvapimple3@gmail.com

5. Continuous Assessment and Remarks Sheet

Problem Identification (Idea Inception) –

The idea inception phase involves identifying the need for a Fire Extinguisher Robot and envisioning its potential benefits. This includes understanding the limitations of existing fire extinguishing methods and recognizing the potential of robotics and automation to improve fire response efficiency and safety.

Problem Analysis (Requirement Gathering) –

The problem analysis phase focuses on understanding the specific challenges and requirements related to fire extinguishing. It involves analyzing fire detection methods, identifying the need for rapid response, considering safety concerns, and evaluating the limitations of current firefighting techniques.

Proposed Solution Model/Design/ Process / prototype –

In the problem solution design phase, the technical aspects of the Fire Extinguisher Robot are defined. This includes specifying the hardware components such as flame sensors, motors, tank, Arduino, gas sensor, ESP32 camera, and Bluetooth module for motor control. The camera module setup, motor driver setup, and servo motor algorithm for gas sensor positioning are designed to address the requirements of fire detection, mobility, and extinguishing capabilities.

Technology Solution Model-

The technology solution model outlines the integration of the hardware and software components to create a functional Fire Extinguisher Robot. It details the connections and interactions between the flame sensors, motors, tank, Arduino, gas sensor, ESP32 camera, Bluetooth module, and the control algorithms. The design should ensure seamless communication and coordination among these components.

Expected Outcomes-

The expected outcomes of the Fire Extinguisher Robot project include improved fire response time, efficient fire extinguishing capabilities, enhanced safety for firefighters, and minimized damage to properties. The robot's ability to capture and provide real-time footage of the fire scene enhances situational awareness and assists in decision-making.

Implementation and Testing-

Successfully implemented all possible functions and even tested it working fine with all possible outcomes.

Regularity (Attendance + Weekly Progress Reporting) –(To be filled by Teacher)
Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects-(To be filled by teacher)
Contest Participation/ publication-(To be filled by teacher)
Report –(To be filled by Teacher)

6. **Project Monitoring/ Progress Information Sheets** (one sheet per week, 3-4 weeks sheet should be added)

Week 1
Date
Current Work phase of project- Start collecting required permissions .
Discussions Held As discussed we have to make a chasis out of metal sheet , so we're currently taking permission from workshop to allow us to use equipments and make chasis over there.
Progress till Date Marked the sketched on sheet, made requirement hole cutouts, done the implementation of cutting and drilling also fishing the edges.
Remark **Sign of Mentor**

Week 2
Date
Current Work phase of project- Starting
Discussions Held Trying to get knowledge of every sensor and their types, allocating information about it and marking as a list which sensors to buy.
Progress till Date Purchased the required sensors, also compared the prices and preferred as offline to buy.
Remark **Sign of Mentor**

Week 3
Date
Current Work phase of project- Started with implementation
Discussions Held Took sensors, placed on to chasis, uploaded the code in arduino and tested each sensor one by one, attached all four motors with wheels, also attached the Bluetooth sensor
Progress till Date Tested all motors and their efficiency controlled via Bluetooth module HC05.
Remark **Sign of Mentor**

Week 4
Date
Current Work phase of project- Midway
Discussions Held As in phase of try and test, we are testing each sensors then we are collectively testing its working
Progress till Date Worked with flame and gas sensor ad implemented their code also attached the submerged motor and servo motor
Remark **Sign of Mentor**

Week 5
Date
Current Work phase of project- Updation
Discussions Held As the implementation was done very early , tried to make new update by adding camera sensor also tried both Esp32 and OV7670 camera sensor
Progress till Date Selected ESP32 camera sensor, downloaded all internal file in Arduino ide, and tested the camera sensor working or not .
Remark **Sign of Mentor**

Week 6
Date
Current Work phase of project- Final state
Discussions Held Made a upper box, attached pipe to motor and then attached to submerged motor, placed camera sensor, gas sensor on upper box, also placed different LEDs and light for better design model
Progress till Date Tested the whole project and shown to mentor, also made refinements in code and design too.
Remark **Sign of Mentor**

Project Code

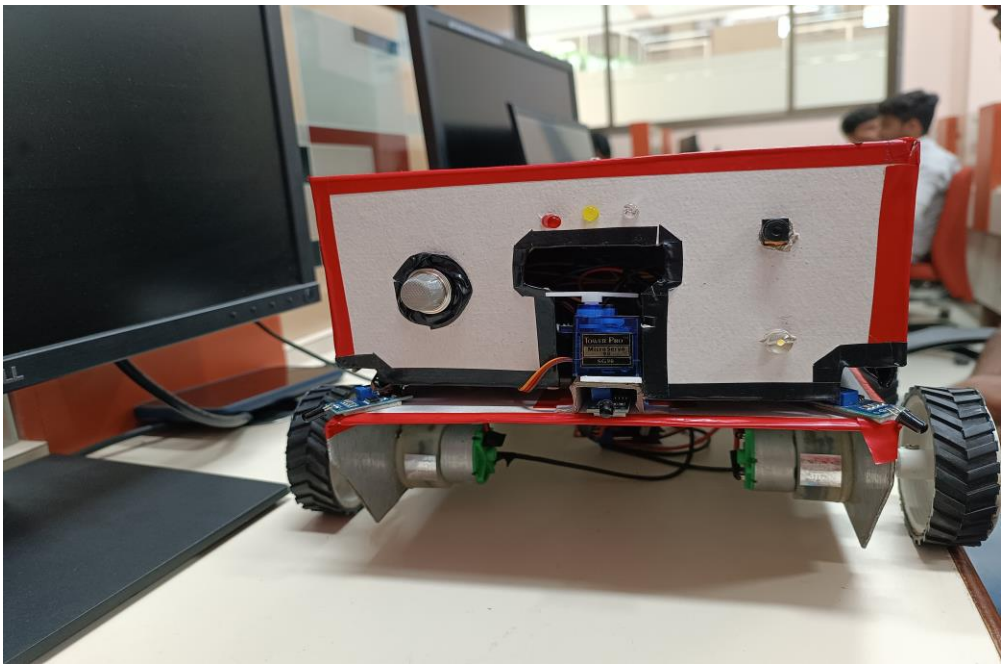
```
#include <Servo.h>
#include <SoftwareSerial.h>
Servo myservo;
SoftwareSerial bluetooth(0, 1);

int pos = 0;

int motor1_pin1 = 2;
int motor1_pin2 = 3;

int motor2_pin1 = 4;
int motor2_pin2 = 5;

int flameR = 8;
int flameL = 6;
int flameM = 7;

int sub = 10;

int sm = A0;
int smTh = 400;

void setup() {
  Serial.begin(9600);
 bluetooth.begin(9600);

 myservo.attach(9);
  myservo.write(0);

  pinMode(sub, OUTPUT);


  pinMode(flameL, INPUT);
  pinMode(flameM, INPUT);
  pinMode(flameR, INPUT);

 pinMode(motor1_pin1, OUTPUT);
  pinMode(motor1_pin2, OUTPUT);
  pinMode(motor2_pin1, OUTPUT);
  pinMode(motor2_pin2, OUTPUT);

  pinMode(motor1_pin1, LOW);
  pinMode(motor1_pin2, LOW);
  pinMode(motor2_pin1, LOW);
  pinMode(motor2_pin2, LOW);
}
```

```
void loop() {
  smoke_De();

  if (bluetooth.available()) {
    char command = bluetooth.read();
    if (command == 'F') { // Move forward
      forward();

    }
   else if (command == 'G') { // Move backward
      backward();

    }
    else if (command == 'L') { // Turn left
      left();

    }
    else if (command == 'R') { // Turn right
      right();

    }
    else if (command == 'S') { // Stop
      stop();
    }
  }

   if ( digitalRead(flameR) == 0 )
  {

    flame_R();
    submerge();

  }

   else if ( digitalRead(flameL) == 0 )
  {

    flame_L();
    submerge();

  }

   else if(digitalRead(flameM) == 0)
  {
    flame_M();
    submerge();
  }

  else{
    myservo.write(0);
```

```
   digitalWrite(sub, LOW);

  }

}

void forward() {
   digitalWrite(motor1_pin1, HIGH);
   digitalWrite(motor1_pin2, LOW);
   digitalWrite(motor2_pin1, HIGH);
   digitalWrite(motor2_pin2, LOW);

}

void backward() {
  digitalWrite(motor1_pin1, LOW);
  digitalWrite(motor1_pin2, HIGH);
  digitalWrite(motor2_pin1, LOW);
  digitalWrite(motor2_pin2, HIGH);

}

void right(){
  digitalWrite(motor1_pin1, LOW);
  digitalWrite(motor1_pin2, HIGH);
  digitalWrite(motor2_pin1, HIGH);
  digitalWrite(motor2_pin2, LOW);

}

void left(){
  digitalWrite(motor1_pin1, HIGH);
  digitalWrite(motor1_pin2, LOW);
  digitalWrite(motor2_pin1, LOW);
  digitalWrite(motor2_pin2, HIGH);

}

void stop(){
  digitalWrite(motor1_pin1, LOW);
  digitalWrite(motor1_pin2, LOW);
  digitalWrite(motor2_pin1, LOW);
  digitalWrite(motor2_pin2, LOW);
}

void flame_L(){
   Serial.write("flame L:::   detected\n");

     for (pos = 90; pos <= 180; pos += 1) { // goes from 180 degrees to 0 degrees
     myservo.write(pos);              // tell servo to go to position in variable 'pos'
     delay(15);                       // waits 15 ms for the servo to reach the position
```

```
  }
  for (pos = 180; pos >= 90; pos -= 1) { // goes from 0 degrees to 180 degrees
    myservo.write(pos);            // tell servo to go to position in variable 'pos'
    delay(15);                     // waits 15 ms for the servo to reach the position
  }

}

void flame_M(){
  Serial.write("flame M::: detected\n");

    for (pos = 0; pos <= 180; pos += 1) { // goes from 0 degrees to 180 degrees
    myservo.write(pos);            // tell servo to go to position in variable 'pos'
    delay(15);                     // waits 15 ms for the servo to reach the position
  }
  for (pos = 180; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees
    myservo.write(pos);            // tell servo to go to position in variable 'pos'
    delay(15);                     // waits 15 ms for the servo to reach the position
  }

}


void flame_R(){
  Serial.write("flame R::: detected\n");

    for (pos = 0; pos <= 90; pos += 1) { // goes from 0 degrees to 180 degrees
    myservo.write(pos);            // tell servo to go to position in variable 'pos'
    delay(15);                     // waits 15 ms for the servo to reach the position
  }
  for (pos = 90; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees
    myservo.write(pos);            // tell servo to go to position in variable 'pos'
    delay(15);                     // waits 15 ms for the servo to reach the position
  }

}

void smoke_De(){
  if (analogRead(sm) > smTh){
  Serial.println("ATTENTION !!!! GAS DETECTED");

 }
 else{
  Serial.println("PERFECT");

 }
}
void submerge(){
  digitalWrite(sub, HIGH);

}
```

Output printscreen



Camera Module :